

REMARKS

The Applicants thank the Examiner for acknowledging admission of a request for continued examination under CFR 1.114. In this response to the Office Action dated July 7, 2008, Claims 1, 5, 6, 15, 21 and 22 have been amended. Some features of claims 5 and 6 are incorporated in claim 1 and such features are deleted from the claims 5 and 6. Some features of claims 21 and 22 are incorporated in claim 15 and such features are deleted from the claims 21 and 22. In addition, new Claim 38 has been added, which finds support in Example 1 of the specification. Accordingly, no new matter is added. Claims 1, 3-15, 19-23, 26-31, 33 and 35-38 are currently pending.

Rejection under 35 USC 103(a) (Obviousness)

The Examiner rejected claims 1, 3-15, 19-23, 26-31, 33 and 35-37 under 35 U.S.C. § 103(a) as being unpatentable over Stathatos et al. in view of Yamada et al. (US 5,897,958), Ogawa et al. (US 6,106,955), Makita et al. (US 4,993,354), Brill (US 3,017,282) and Brill (US 3,002,854). On the basis of following remarks, Applicants respectively request withdrawal of rejection.

"Consisting Essentially Of"

All of the presently pending claims recite "a stabilizer consisting essentially of a 2,4-diketone." In responding to Applicants' earlier remarks, the Examiner indicated that the Applicant had provided no evidence that the phrase "consisting essentially of" excludes a water soluble acid, such as is disclosed in the two Brill cited Brill references. Accordingly, before specifically addressing the merits of the obviousness rejection, Applicants are first addressing the interpretation of the "consisting essentially of" language.

As cited in MPEP § 2111.03, the transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps "and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. *In re Herz*, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976). Thus, the question of whether applicant's claims exclude the presence of the acid disclosed in Brill '282 and Brill '854 can be rephrased as whether the acid materially affects the basic and novel characteristics of the claimed stabilizer.

The present specification states that a 2,4-diketone, such as acetylacetone, is added as a stabilizer to control the rate of hydrolysis of titanium alkoxide. Paragraph 4 of the attached Declaration of the inventor, Chai Mei Jimmy Yu, establishes that the acid added in Brill '282 and '854 serves this same function. In particular, "In Brill '854 or '282, acid can be added to prevent

undesirable precipitation of the reaction mixture. At column 2, lines 48-53, Brill '282 specifically states that a 2,4-diketone, such as acetylacetone, also serves to redissolve undesirable precipitate. These precipitates are unstable in solution and therefore the hydrolysis of titanium alkoxide cannot be well controlled in their presence. Thus, the acid disclosed in Brill '282 and Brill '854 performs the same function as 2,4 diketone in the present invention, i.e. to serve as a stabilizer that controls the rate of hydrolysis of titanium alkoxide by avoiding undesirable precipitation." Since the acid of Brill serves the same function as the recited stabilizer, it would affect the same basic characteristics of the stabilizer as the recited 2,4 diketone. Accordingly, the phrase "consisting essentially of" would exclude materials like the acid disclosed in the two Brill references, which perform the same function as the recited 2,4 diketone.

Teachings of Brill References

The Examiner relied on the two Brill references as suggesting that acetylacetone alone can be used as a stabilizer. Brill '282 and Brill '854 relate to processes of preparing aqueous solutions of titanium-containing reaction products and the use thereof. In particular, Brill '282 discloses that addition of acetylacetone to the solution containing alkyl titanate can make a precipitate of the solution disappear (*See* column 2, lines 44-47). However, at the same time, Brill '282 also discloses that such action of acetylacetone is effective only if the concentration of the reaction mixture [i.e. alkyl titanate-acetylacetone mixture] is lower than 3% in the solution. Specifically, at column 2, lines 28-34, Brill '282 teaches that;

When the liquid from the reaction is mixed with pure water, a clear solution appears to be formed at first, but such a solution rapidly becomes cloudy and eventually a substantial quantity of a yellow precipitate forms. This instability is particularly noted in solutions which exceed about 3% concentration of the alkyl titanate-acetylacetone reaction product.

Consistent with Brill '282, Brill '854 discloses that the "reaction mixture [i.e. alkyl titanate-acetylacetone mixture] forms a precipitate which is unusable in this invention when added to water in amounts which exceed 2% or 3%." (Column 2, lines 41-44). Thus, both Brill '282 and '854 teach that an acid is necessary to keep the solution of the reaction mixture free from having a substantial amount of precipitates. Brill '282 further discloses that "if the solution is immediately made acid with acetic acid, or other water miscible acid, to a pH below about 4.5, the resulting solution shows no sign of turbidity on standing for a prolonged period" (Column 2, lines 34-38). Similarly, Brill '854 teaches that preparing more concentrated, aqueous solution of the reaction mixture without undesirable precipitation "is accomplished by an adjustment of the

pH of the solution to below about 4.5 by the addition of a water-soluble acid.” (Column 2, lines 48-52).

The Examiner asserted that one of ordinary skill in the art would expect that an acid would not be necessary where the amount of reaction mixture is less than 5% of the aqueous solution and that amounts greater than 5% could be used without an acid where the amount of precipitations undesirable. However, this statement stretches the teachings of the Brill references. As correctly cited by the Examiner, Brill ‘854 discloses that “in this invention the concentration of the reaction mixture is often below 5% so that it is possible in many cases to add the desired amount of reaction mixture to water.” (Column 2, lines 52-55) However, in the same reference, Brill also describes that “it has been found that any tendency towards precipitation is eliminated if the more concentrated acidic solution of my copending application [i.e. Brill ‘282] are first prepared and then diluted to the desired concentration with water or a water-miscible solvent, such as a low boiling alcohol.” (Column 2, lines 55-60). Thus, the Brill ‘854 reference teaches that even when the concentration of the reaction mixture is below 5% in the solution, the solution should still be made acidic, and then can be diluted with water. In order words, Brill expressly discloses the necessity of adding the acid to prevent precipitation even when the reaction mixture has a concentration of 5% or lower.

Moreover, even if Brill ‘854 were read as teaching that the acid can be omitted when the concentration of reactants is below 5%, the two Brill references would still teach at a minimum that (1) the water soluble acid is necessary as a stabilizer for the reaction solution when the concentration of reaction mixture exceeds 5% and (2) in the absence of the acid, acetylacetone alone is not a sufficient stabilizer for the mixture at a concentration of greater than 5%.

The Claimed Invention

All of the presently pending claims recite “titanium alkoxide in a concentration from 0.2 to 0.3 M.” The titanium alkoxide having the lowest molecular weight is titanium methoxide, which has a single carbon atom. This compound has a molecular weight of 172.00. See http://www.gelest.com/search/default.asp?dbname=gelest&dataaction=query_string&form_group=basenp_form_group&field_type=TEXT&full_field_name=MAIN.Catnum&field_value=AKT880. Thus, the lowest amount of titanium alkoxide that can be present by weight in the reaction mixture recited in the pending claims would be in 0.2M titanium methoxide. Using the

molecular weight of this compound (172.0), 0.2M titanium methoxide can be converted into 3.44% (w/v).

However, the reactant mixture referred to by Brill, includes both titanium alkoxide and acetylacetone. See, e.g. Brill '282 at Column 2. Thus, the reactant mixture in the presently claimed invention includes the recited 2%-5% of a 2,4-diketone by volume that is added. In order to have a 2,4 diketone, at least five carbon atoms must be present. If fewer than five carbons were present, there could not be a ketone group at the 2 and 4 positions. Thus, the 2,4 diketone with the lowest molecular weight is acetyl acetone. The density of acetylacetone is quite similar to that of water. being approximately, 0.98g/ml. See <http://en.wikipedia.org/wiki/acetylacetone>. Thus, the lowest amount of 2,4-diketone that can be present in the recited reaction mixture is approximately 1.96% w/v. Accordingly, the lowest possible concentration of reactants in the reactant mixture recited in all of the presently pending claims would be 3.44% from the titanium alkoxide and 1.96% from the 2,4-diketone, for a total of 5.4%. As such, the minimum concentration of the reactants in the recited reaction mixture is over the 5% limit mentioned in Brill '854.

In view of the foregoing, the Brill references clearly teach away from the present invention in which reactant mixture concentration of a minimum of 5.4% is used in combination with a stabilizer that consists essentially of a 2,4-diketone. In view of this teaching away, the recited combination of references simply would not lead one having ordinary skill in the art to the presently claimed invention. None of the other references cited by the Examiner remedy the deficiency of Brill '282 and '854. Thus, there can be no *prima facie* showing of obviousness with regard to any of the pending claims, which all recite the foregoing concentrations for the components of the reactant mixture.

Moreover, Claim 38 has been added in which the titanium alkoxide is titanium isopropoxide. As illustrated in Example 1 of the instant application, isopropyl titanate (titanium (IV) isopropoxide, molecular weight: 284.26) is an exemplary titanium alkoxide. Using this molecular weight, 0.2 to 0.3M isopropyl titanate can be readily converted to about 5.7 to 8.5% (w/v). Thus, when titanium isopropoxide is used the titanium alkoxide component alone is necessarily greater 5% w/v. The Brill references teach even further away from the invention of Claim 38, which is therefore, patentable even without a more restrictive limitation on the amount of 2,4 diketone.

Criticality of Recited Concentrations

The specific concentrations of 2,4-diketone and titanium alkoxide recited in the presently claimed invention provide the unexpected result that a stabilizer consisting essentially of 2,4-diketone can be used without the instability and precipitation noted by the Brill references. Brill '282 describes that "the preferred reacting proportions are 2 mols of acetylacetone to 1 mol of alkyl titanate" (Column 2, lines 14-19). Brill '854 has a similar description that "the alkyl titanate-acetylacetone reaction products can be prepared by simply mixing together acetylacetone and an alkyl titanate in the ratio of 1 to 4 mols of acetylacetone per mol of alkyl titanate." (Column 2, lines 29-32) In this connection, the mols of acetylacetone are equivalent to or (preferred) up to 4 times higher than the mols of alkyl titanate so as to protect the alkyl titanate-acetylacetone reaction mixture from forming a precipitate. In the presently claimed invention, however, 2,4-diketone is used in a concentration of 2 to 5% of the reverse micelle solution which becomes 0.02 mol to about 0.05. Thus the mols of 2,4-diketone are much lower than the 0.2 to 0.3 mols of titanium alkoxide and thereby the ratio between titanate alkoxide and acetylacetone is reversed in the present application. With this reversed ratio, the acid described by Brill becomes unnecessary. As such, the recited concentrations of titanium alkoxide and 2,4-diketone are critical components of the claimed invention. Even in view of all of the cited references, one having ordinary skill in the art could not have predicted that these critical concentrations could lead to the elimination of the acid. Thus, for this reason as well, the cited combination of references cannot lead to a *prima facie* showing of obviousness with regard to the claimed invention.

Although Applicants have not addressed all the issues of the dependent claims of claims 1 or 15, Applicants believe that each claim is patentable on its own merits. In any event, the dependent claims incorporate by reference all the limitations of the claims to which they refer and are patentable at least for the same reasons as the independent claims, in addition to including their own patentable features. Therefore, the dependent claims are believed to be in condition for allowance. Therefore, Applicants respectfully request the withdrawal of all claim rejections and prompts allowance of the claims.

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicants are not conceding in this

application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

CONCLUSION


In view of Applicants' foregoing Amendments and Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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